LIGHT EMITTING ARTICLES WITH LIGHT REFLECTING STRUCTURES

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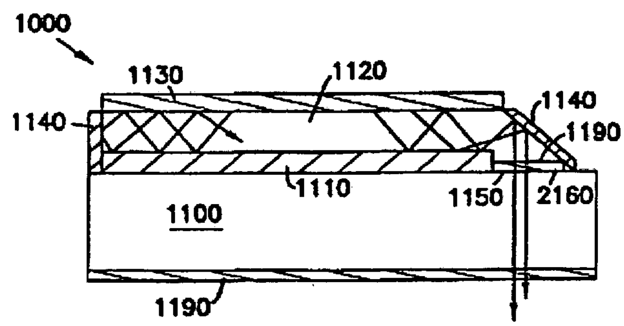
Light emitting articles comprising a substrate (1100), a light reflecting structure (1110) positioned in or on the substrate, and an organic light emitting device (1000) positioned in or on the light reflecting structure (1110). The light emitting articles of the present invention minimize waveguiding, thus increasing efficiency, brightness and resolution.



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CLAIMS

[Claim(s)]
1. It is Emitter. : Substrate;
The lower structure with the part the description is in the upper part and a lower part by the light reflex structure arranged to the top in the above-mentioned substrate, and narrower than a part on this; it reaches. Organic light emitting device arranged to the top in the above-mentioned light reflex structure;
The emitter which turns to the direction of the part under the above-mentioned light reflex structure the light to which an implication and the above-mentioned light reflex structure came out of the above-mentioned organic light emitting device.
2. the emitter of claim 1 -- setting -- the above-mentioned substrate -- transparent --; -- and -- Direct [structure / above-mentioned / light reflex / in the part under this light reflex structure / to the above-mentioned substrate] on the above-mentioned substrate ** which turns to the direction of the above-mentioned substrate the light which carried out ******, has arranged and came out of the above-mentioned organic light emitting device Phaosome.
3. In emitter of claim 2 Emitter including the side attachment wall with which the above-mentioned light reflex structure crosses by the part and acute angle under this.
4. Emitter which is emitter of claim 3 and contains reflector on above-mentioned side attachment wall further.
5. the emitter of claim 2 -- setting -- the side attachment wall of plurality [structure / above-mentioned / light reflex] -- containing --; -- and -- Emitter with which each of these side attachment walls crosses by the part and acute angle under this.
6. Emitter which is emitter of claim 5 and contains reflector on at least one of the side attachment walls of further above-mentioned plurality.
7. Emitter whose above-mentioned light reflex structure is mesa structure in emitter of claim 5.
8. In Emitter of Claim 7 : The Above-mentioned Organic Light Emitting Device is Arranged on the Above-mentioned Mesa Structure, and it is in; List. The Above-mentioned Organic Light Emitting Device : Anode on the Above-mentioned Mesa Structure;
The 1st organic layer which is an electron hole transportation layer on the above-mentioned anode;
The 2nd organic layer which is the emission nature on the 1st organic layer of the above, and is an electronic transportation layer; it reaches. Cathode on the 2nd organic layer of the above;
****** emitter.
9. In Emitter of Claim 7 : The Above-mentioned Organic Light Emitting Device is Arranged on the Above-mentioned Mesa Structure, and it is in; List. The Above-mentioned Organic Light Emitting Device : Anode on the Above-mentioned Mesa Structure: 1st Organic Layer Which is Electron Hole Transportation Layer on the Above-mentioned Anode;
The 2nd organic layer which is emission **** on the 1st organic layer of the above;
The 3rd organic layer which is an electronic transportation layer on the 2nd organic layer of the above; it reaches. Cathode on the 3rd organic layer of the above;
****** emitter.
10. The emitter which arranges the above-mentioned organic light emitting device on the above-mentioned mesa structure in the emitter of claim 7.
11. The emitter which arranges the above-mentioned organic light emitting device in the above-mentioned mesa structure in the emitter of claim 7.
12. In the emitter of claim 1 : Emitter whose 3rd thing of the above-mentioned light reflex structure the 1st thing of the above-mentioned light reflex structure is [each of the above-mentioned pixel] a blue glow

emitter including the three above-mentioned light reflex structures including two or more pixels for the above-mentioned emitter, and the 2nd thing of the above-mentioned light reflex structure is a green light emitter, and is a red light emitter.
13. The emitter with which the above-mentioned organic light emitting device gives off blue glow in the emitter of claim 12.
14. The emitter which contains the green lower part conversion fluorescent substance layer which changes all into green light substantially [the blue glow to which the 2nd thing of the above-mentioned light reflex structure came out of the above-mentioned organic light emitting device] in the emitter of claim 13.
15. The emitter which contains the red lower part conversion fluorescent substance layer which changes all into red light substantially [the blue glow to which the 3rd thing of the above-mentioned light reflex structure came out of the above-mentioned organic light emitting device] in the emitter of claim 13.
16. The emitter which is an emitter of claim 1 and contains the organic light emitting device of at least one addition further.
17. The emitter arranged in the emitter of claim 16 to the equipment which accumulated the above-mentioned organic light emitting device and the organic light emitting device of at least one addition.
18. Set to the emitter of claim 17 and the above-mentioned organic light emitting device and the organic light emitting device of at least one addition are the emitter which can respond independently.
19. In the emitter of claim 2 The above-mentioned light reflex structure includes at least three side attachment walls, and it is in; list. One of the above-mentioned side attachment walls constitutes an acute angle about the above-mentioned substrate, and the remainder of the above-mentioned side attachment wall describes above. It is [a substrate and] a perpendicular emitter substantially.
20. in order to take out the light which it is the emitter of claim 19, and the above-mentioned light reflex layer has at least one opening further at it including a light reflex layer on the above-mentioned substrate, and came out of the above-mentioned organic light emitting device there from the above-mentioned substrate -- the above -- the emitter turned so that it may pass along one opening, even if few.
21. In the emitter of claim 20 The above-mentioned light reflex layer has one opening in it, is related with the above-mentioned substrate in the above-mentioned opening, and it is an acute angle. Emitter arranged immediately under the above-mentioned side face of the above-mentioned light reflex structure to accomplish.
22. The emitter whose above-mentioned acute angle is about 45 degrees in the emitter of claim 21.
23. the emitter of claim 19 -- setting -- the above-mentioned light reflex structure -- at least three side attachment walls -- containing --; list the above -- even if few -- the plurality of three side attachment walls -- the above-mentioned substrate -- being related -- an acute angle -- accomplishing -- and the above any of at least three side faces, or the remaining side face -- the above-mentioned substrate -- substantial -- perpendicular ** Phaosome.
24. the emitter of claim 23 -- setting -- opening of plurality [layer / above-mentioned / light reflex / it] -- having -- each of the above-mentioned opening -- the above-mentioned substrate -- being related -- the above which accomplishes ****** -- even if few -- immediately each bottom of the above-mentioned plurality of three side attachment walls -- ****** ********.
25. The emitter which the light which comes out of two or more above-mentioned openings converges on a common focus in the emitter of claim 24.
26. the emitter of claim 1 -- setting -- the part on the above-mentioned light reflex structure -- the above-mentioned substrate -- immediately -- adjoining -- the above-mentioned organic light emitting device ** -- ****** -- emitter turned in the direction which separates from the above-mentioned substrate.
27. In the emitter of claim 26 The above-mentioned light reflex structure is a pit in the top face of the above-mentioned substrate, and they are; and the above-mentioned light reflex structure. Emitter with the part flat-tapped with this top face of the above-mentioned substrate on the body.
28. In Emitter of Claim 27 : The Above-mentioned Organic Light Emitting Device is Arranged in the Above-mentioned Pit, and it is in; List. The Above-mentioned Organic Light Emitting Device : Cathode on the Above-mentioned Substrate;
The 1st organic layer which is the emission nature on the above-mentioned cathode, and is an electronic transportation layer;
The 2nd organic layer which is an electron hole transportation layer on the 1st organic layer of the above; it reaches. Anode on the 2nd organic layer of the above;
****** emitter.
29. In Emitter of Claim 27 : The Above-mentioned Organic Light Emitting Device is Arranged in the

Above-mentioned Pit, and it is in; List. The Above-mentioned Organic Light Emitting Device : Cathode on the Above-mentioned Substrate;.
The 1st organic layer which is an electronic transportation layer on the above-mentioned cathode;
The 2nd organic layer which is emission **** on the 1st organic layer of the above;
The 3rd organic layer which is an electron hole transportation layer on the 2nd organic layer of the above; it reaches. Anode on the 2nd organic layer of the above;
****** emitter.
30. The emitter which is an emitter of claim 26 and contains at least one pit formation structure on the above-mentioned substrate further.
31. the emitter of claim 30 -- setting -- the above-mentioned light reflex structure -- the above -- the emitter which is the pit made by the one pit formation structure even if few.
32. The emitter which is the handstand mesa structure where the above-mentioned light reflex structure has two or more side faces in the emitter of claim 27.
33. The emitter with which the part on the above-mentioned light reflex structure accomplishes the above-mentioned side face and the include angle of about 135 degrees in the emitter of claim 32.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
Field of emitter invention equipped with the light reflex structure This invention relates to the emitter designed so that effectiveness might be made into the highest and loss by guided wave nature might be made into min in more detail about an organic light emitting device (OLED).
Background of invention The electronic display is used by the host of the application of a television set, a computer terminal, a telecommunication device, and others. In the class of electronic display which can carry out current use, there is a serious interest for a flat-panel display technique, and the advance is continuously made in this field. The desirable factor over a display technique has a full color display at the capacity to bring about high resolution, and a price which is a good brightness level and can compete. When it excites with a current, the thin film which gives off light is used for an organic light emitting device (OLED), and it has a general form of a flat-panel display technique increasingly. The present most desirable organic luminescence structure is called the duplex hetero structure (DH) OLED, and it is shown in drawing 1 A.
This component covers the substrate layer 10 of glass by the thin layer 11 of an indium stannic acid ghost (ITO). Next, the organic electron hole transportation layer [being thin (100-500A)] (HTL) 12 is put on the ITO layer 11. The thin (typically 50A - 500A) emission layer (EL) 13 adheres on HTL12. This EL13 offers the location for recombining with the electron hole from HTL12 the electron poured in from the electronic transportation layer 14 (ETL) with a thickness of 100-500A. The example of ELT of the advanced technology, EL, and an HTL ingredient is indicated by U.S. Pat. No. 5,294,870, and uses the indication here by reference.
Since the color of this OLED is changed and electroluminescence effectiveness is often increased, the coloring matter of fluorescence is added to EL13 at altitude. This component is completed by attaching the metal contacts 15 and 16 and the up electrode 17, as shown in drawing 1 A. Contacts 15 and 16 are typically manufactured from an indium or Ti/Pt/Au. an electrode -- 17 -- often -- organic -- ETL -- 14 -- direct -- contacting -- Mg/Ag -- 17 -- ' -- like -- an alloy -- this -- Mg/Ag -- a top -- gold -- (-- Au --) -- or -- silver -- (-- Ag --) -- like -- thick -- a work function -- being high -- a metal -- a layer -- 17 -- " -- from -- changing -- a double layer -- structure -- it is . This thick metal 17" is opaque. When applying proper bias voltage between the up electrode 17 and contacts 15 and 16, light emission happens from emission **** 13 through a glass substrate 10. Therefore, the LED component of drawing 1 A has 0.05% thru/or 2% of luminescent external quantum efficiency typically in the color and component structure to emit.
Another well-known organic emission nature structure is called the single hetero structure (SH) OLED, and is shown in drawing 1 B. The difference between this structure and DH structure is that multifunctional layer 13' serves as both EL and ETL. One fault of the component of drawing 1 B is that the electronic transport capacity of multifunctional layer 13' must be good. Otherwise, it should prepare so that separate EL layer and a separate ETL layer may be shown to the component of drawing 1 A.
Furthermore, another well-known LED component is shown in drawing 1 C, and it illustrates the typical sectional view of Monolayer (polymer) OLED. Like illustration, this component contains the glass substrate 1 covered with the tin ITO layer 3. For example, the thin organic layer 5 of the polymer which carried out spin coating is made on the ITO layer 3, and all the functions of HTL of the component explained previously, ETL, and EL layer are given. The metal-electrode layer 6 is made on an organic layer 5. Typically, this metal is a metal of a low work function which Mg, calcium, or others usually uses.
The example of the multicolor electroluminescence image display component which uses an organic compound for a luminescence pixel is indicated by U.S. Pat. No. 5,294,870. This patent indicates two or more luminescence pixels containing an organic medium, in order to give off blue glow. A fluorescence

medium is arranged between blue OLED and a substrate in a part with these pixels. This fluorescence medium absorbs the light which blue OLED gives off, and gives off red light and green light in the field in which the same pixels differ. One fault of this display is producing a fall and loss of dotage of the light in which the guided wave nature of the light which passes along a glass substrate to the pixel which adjoins from one pixel let waveguide pass, a color blot, and image resolution. It is shown in drawing 1 D roughly about the component which shows this problem to drawing 1 A, and it is explained in more detail at "absorption of photoluminescence effectiveness and an aluminum TORIKINO rate (Alq3) thin film" besides D.Z. gal BUZOFU, and the 249 Chemical physics letter 433 (1996), and it is used here by reference.
ITO used as a conductive layer of transparence is a high loss ingredient, therefore the further problem of this component is resulting in absorbing the light in which the ITO layer's let waveguide pass. One additional problem faced with the component of the advanced technology of this and others is it being visible to those whom the line which links this LED looks at as linea nigra surrounding each pixel, then restricting the increase of the granularity of this display, and resolution.
Outline of invention This invention contains the monochrome and multicolor emitter which use the light reflex structure, in order to reduce the increase of effectiveness, and loss by the guided wave nature of light emission useful in respect of others. Each of the example of this invention contains OLED arranged to the top the light reflex structure arranged to the top a substrate and in this substrate, and in this light reflex structure. This light reflex structure has the description in the upper part and a lower part, and turns to the direction of the part under this the light to which the part on this was narrower than the lower part, and came out of this OLED.
In one mode, the emitter of this invention contains two or more pixels which have at least one light reflex structure which carried out the form of a mesa where it had an inclination wall, respectively. The mesa used for this invention carries out the form of a truncated pyramid, and its upper part is respectively narrower than the part under it, and it turns light in the direction of the part under it from the part on it by reflection of the side attachment wall.
The emitter of this invention consists of another mode so that light emission may be concentrated.
Such an emitter contains at least one OLED on the light reflex structure of the form of a transparence substrate, the light reflex layer on this substrate, and the waveguide on this light reflex layer, and this waveguide respectively. This light reflex layer has at least one opening in it. In order to reflect in this light reflex structure side attachment wall and a light reflex layer and to take out the light which came out of this OLED from this substrate, it turns so that it may pass along opening of this light reflex layer.
In the 1st example, including the light emitting device to which the each has arranged the emitter of this invention on a transparence substrate in three mesas including two or more pixels, the 1st thing of the above-mentioned mesa carries out the role of a blue glow emitter there, and the 2nd thing of the three above-mentioned mesas carries out the role of a green light emitter, and the 3rd thing of the three above-mentioned mesas carries out the role of a red light emitter. The light which the part under each mesa adjoined this substrate immediately, and each mesa gave off in this example is turned to the direction of this substrate.
In the 2nd example, the emitter of this invention contains the light emitting device arranged to the mesa where the each has three inclination walls which did a handstand including two or more pixels. Then, the 1st thing of the three above-mentioned handstand mesas carries out the role of a blue glow emitter, and the 2nd thing of the three above-mentioned handstand mesas carries out the role of a green light emitter, and the 3rd thing of the three above-mentioned handstand mesas carries out the role of a red light emitter. Since the light which the part on each mesa adjoined this substrate immediately, and each mesa gave off in this example is turned in the direction which separates from this substrate, these mesas are called "Having done a handstand." these handstand mesas -- a substrate top -- or it arranges in a substrate.
Including two or more pixels, for structure, it combines and, as for the emitter of this invention, the each contains independent or the light emitting device arranged to the single mesa or handstand mesa which carries out the role of the emitter of blue, green, or red light in accumulation of blue, green, and blue OLED in the 3rd example.
In the 4th example, the emitter of this invention contains at least one OLED on the light reflex structure of the form of a transparence substrate, the light reflex layer on this substrate, and the waveguide on this light reflex layer, and this waveguide of this invention. This waveguide has a top face, a base, and at least three side faces, one of the side faces of these is in the include angle of less than 90 degrees about this substrate, and its remainder of these side faces is perpendicular to this substrate. The light which came out of these OLED(s) is reflected on the side face of this light reflex layer and this waveguide. Therefore, in order to emit the light which came out from this substrate, it turns so that it may pass along opening of this light

reflex layer intensively.
In the 5th example, it has at least two side faces which have the waveguide of the 4th example in the include angle of less than 90 degrees about this substrate, and the remaining side face is perpendicular to this substrate. It has two or more openings located under the side face of this waveguide that has this light reflex layer in the include angle of less than 90 degrees about this substrate. Then, the light which came out of these OLED(s) is reflected on the side face of this light reflex layer and this waveguide. Therefore, in order to emit the light which came out from this substrate and to converge on a common focus, it turns so that it may pass along these openings of this light reflex layer intensively.
Easy explanation of a drawing Drawing 1 A is the sectional view of the typical organic duplex hetero structure light emitting device (OLED) by the advanced technology.
Drawing 1 B is the sectional view of the typical organic single hetero structure light emitting device (LED) by the advanced technology.
Drawing 1 C is the sectional view of the well-known monolayer polymer LED structure by the advanced technology.
Drawing 1 D shows the problem of the guided wave nature in the conventional structure LED structure.
Drawing 2 A, drawing 2 B, and drawing 2 C are the sectional views of the accumulation 3 color pixel which uses red and a green lower part conversion fluorescent substance layer for a blue light emitting device (OLED) list by the example of this invention.
Drawing 2 D shows the laminating equipment of the blue of the mesa pixel configuration by the example of this invention, green, and red OLED.
Drawing 3 shows the top view of one example of this invention.
Drawing 4 A thru/or drawing 4 D show how to make the 1st example of this invention as shown in drawing 2 A.
Drawing 5 A thru/or drawing 5 E show how to make the 2nd example of this invention as shown in drawing 2 B.
Drawing 6 A thru/or drawing 6 D show how to make the 3rd example of this invention as shown in drawing 2 D.
Drawing 7 A and drawing 7 B are each, sectional views, and top views of an example of this invention.
Drawing 7 C is the sectional view of the handstand condition of the component shown in drawing 7 A.
Drawing 8 A and drawing 8 B are each, sectional views, and top views of an example of this invention.
Drawing 9 shows the critical angle for theta>thetac and internal reflection roughly.
drawing 10 A thru/or drawing 10 C -- this invention -- therefore, a certain OLED deformation which can be used is shown.
Drawing 11 A thru/or drawing 11 B show the effect and component effectiveness of light emitting device die length over luminescence reinforcement in a graph, respectively.
Detailed explanation The 1st example of this invention is shown in drawing 2 A. In this example, for the collimator effectiveness of the light reflex structure which has the form of mesa structure, guided wave nature decreases and a radiation output increases.
The specular reflection from the metal which was based on total reflection from the inclination wall of this mesa structure, or adhered to these inclination walls attains this collimation.
These laminatings contain the red and/or the green lower part conversion fluorescent substance which are therefore pointed out to a specific laminating by 21 and 22 at blue OLED layer 20 list, respectively including the pixel in which the component shown in drawing 2 A has three mesa laminatings on a common substrate 37. Generally a substrate 37 is manufactured from glass, a quartz, sapphire, or a transparent material like plastics. This OLED layer is a monolayer of DH, SH structure, or the polymer base OLED, as well known for this technique.
A component 24 is a blue emitter containing blue OLED20 which is extended horizontally and also forms the upper limit section of each components 27 and 28. A component 27 is a green emitter from which this fluorescent substance 22 changes the blue glow from OLED into green light including blue OLED20 and the green lower part conversion fluorescent substance 22 of the pars basilaris ossis occipitalis of this laminating. The 3rd component 28 is arranged between blue OLED20 and the green lower part conversion fluorescent substance 22, and contains the red lower part conversion fluorescent substance 21 which changes the blue glow from OLED20 into red light. In this case, red light passes, without the transparent green fluorescent substance 22 being absorbed by red light. It leaves the green lower part conversion fluorescent substance 22 to a component 28 for easy-izing of manufacture. Instead, 28 changes the 3rd element into red light including blue OLED20 and the red lower part conversion fluorescent substance 21 of the pars basilaris

ossis occipitalis of this laminating, without this red lower part conversion fluorescent substance letting the blue glow from OLED20 pass in a green lower part conversion fluorescent substance layer. By another alternative arrangement of 28, the layer of a green lower part conversion fluorescent substance is arranged between OLED20 and the red lower part conversion fluorescent substance 21 the 3rd element. In this arrangement, the green lower part conversion fluorescent substance 22 changes into green light the blue glow which comes out of OLED20, and then the red lower part conversion fluorescent substance 21 changes this green light into red light. However, since component effectiveness tends to fall by the increment in the lower part conversion number of steps, generally this arrangement is not liked. Although the example shown in drawing 2 A uses a lower part conversion fluorescent substance layer, blue, green, and red OLED may be used for components 24, 27, and 28, without [instead] using a lower part conversion fluorescent substance layer.

To a substrate, although about 35 degrees - 45 degrees are desirable, which mesa wall of components 24, 27, and 28 can be formed to the acute angle of arbitration so that guided wave nature may be made into min or may be prevented. The collimator dielectric layer 19 which constitutes the maximum pars basilaris ossis occipitalis of components 24, 27, and 28 is not so, and turns the light which a guided wave is usually carried out to a horizontal pixel, and serves as a cause of reduction of resolution and brightness at a color blot list out of a substrate 37 by reflection of a mesa side attachment wall and the optional reflector 47. It illustrates as a beam R2 which acts so that it may come out of this reflection through a substrate 37 from a dielectric layer 19 and Beam R may be reinforced.

The optional reflector 47 is made from aluminum, silver, Mg/aluminum, or an ingredient like other suitable ingredients. In addition to serving as a reflector, a reflector 47 can be used as an interconnect child by lengthening so that a reflector 47 may be connected with the metal layer 26, as shown in drawing 3 . One clear advantage of using a reflector 47 as an interconnect child is located between the mesas which adjoin so that it may be hidden from those whom such an interconnect child's looks at. Therefore, as for the made display, anything does not have a dark line between pixels which are often looked at by the conventional display component and which adjoin.

Since it is easy, the OLED component used by this invention is shown in a drawing as a monolayer. However, if this OLED is not monolayer BORIMA, the structure of that component will depend arrangement of that lower layer for these layers on DH or SH including two or more lower layers in fact, so that this technique may be used, and it may be known and may explain here.

If OLED of DH is used by this invention, the OLED component 20 will consist of HTL put on the front face of an ITO layer by the approach of vacuum deposition, growth, or others. The upper part ETL sandwiches EL between the former and HTL. Each of this HTL, ETL, ITO, and organic electroluminescence layer is transparent because of those presentations and the minimum thickness. each HTL -- thickness -- 50-1000A -- good --; each EL -- thickness -- 50-500A -- good --; -- every -- ETL -- thickness -- 50-1000A -- good --; and every -- an ITO layer has good thickness at 1000-4000A. Each of these organic layers should be maintained to the direction of the lower limit of the above-mentioned range preferably for optimum performance and low-battery actuation. Each components 24, 27, and 28 (except for ITO / metal layer) have a desirable thing with the thickness near 500A. organic [suitable] -- the example of ETL, EL, and an HTL ingredient can be seen to U.S. Pat. No. 5,294,870.

Metal layer 26M of a low work function (preferably <4eV) makes in the upper part of ETL. The suitable candidate for metal layer 26M has Mg, Mg/Ag, and Li/aluminum. Another conductive layer 26I suitable for carrying out electric contact covered the upper part of metal layer 26M. Conductive layer 26I can be made from ITO, aluminum, Ag, or Au. For convenience, the double layer structure of the metal layers 26M and 26I is called the metal layer 26. Terminal 26T are made on the metal layer 26, and it can connect with it electrically and can make from what that is known for In, Pt, Au, Ag and those combination, or this technique, or a suitable ingredient.

In order to form components 24, 27, and 28, supposing it uses not the OLED component of DH but the OLED structure of SH, as ETL and EL layer were previously explained to SH of drawing 1 B, it will make by single multifunctional layer like layer 13'. This layer 13' is the other well-known ingredients which can attain an aluminum kino rate or the multifunctional purpose of layer 13'. However, the advantage of the OLED laminating of DH in comparison with the OLED laminating of SH is that the OLED laminating of DH generally makes a well head possible.

The electrical potential difference which crosses OLED of each components 24, 27, and 28 is controlled to obtain the desired synthetic luminescent color and brightness to a specific pixel at every moment. Clearly, a component 24 gives off blue glow, and a component 27 gives off green light, and a component 28 gives off

red light. Furthermore, in order that a part may therefore obtain a desired light color in the magnitude of the current of components 24, 27, and 28 to each pixel, the combination from which components 24, 27, and 28 differ can be operated.
Components 24, 27, and 28 can hang a forward bias by cells 32, 31, and 30, respectively. drawing 2 A -- a current -- cathode terminal 26T of the positive terminal of each cells 32, 31, and 30 to the related component -- and -- each -- the layer of each component -- a passage -- a conductive layer 35 top -- having made -- an anode -- a terminal -- 35 -- it flows from T to the negative terminal of each cells 32, 31, and 30. Consequently, light comes out of each OLED layer of components 24, 27, and 28. A detached core 25 prevents short-circuit of a cathode layer and an anode layer. When these pixels are collected and it is made a display, the terminal of an anode and a cathode is pulled out on the edge of a display.
Each components 24, 27, and 28 contain optionally the layer 36 of the low loss and the high refractive-index dielectric material like TiO2 between contact 35 and layers 21, 22, and 19, respectively. A layer 36 is desirable, especially when contact 35 is made from ITO which is a high loss ingredient so that the guided wave of the light from the blue OLED layer 20 may be easily carried out to contact 35 and it may be absorbed. The refractive indexes to TiO2 and TIO are about 2.6 and 2.2, respectively. Therefore, a layer 36 loses substantially the guided wave nature in ITO, and absorption, the light which came out of the blue OLED layer 20 penetrates a layer 36 shortly, or the guided wave of it is carried out within a layer 36, and it is reflected by a mesa side attachment wall and the reflector 47. It is optionally included in components 24, 27, and 28, using as an interlayer, the similar layer, for example, the hole-injection enhancement layer, for improving the engine performance.
In order to obtain light emission from not a bottom but the upper part of a laminating, the component of drawing 2 A consists of the 2nd example of this invention by the opposite or reverse approach. According to this 2nd example, as shown in drawing 2 B (it is not in a scale), a collimator operation of the mesa structure of a "handstand" inclination wall controls the guided wave nature which meets this structure layer. In this example, since the upper part of each mesa adjoins the substrate immediately so that the light which each mesa gives off may be separated from a substrate and may be turned, these mesas are called "Having done a handstand." If there is no handstand mesa structure of drawing 2 B, the guided wave nature which meets these structure layers may be connected with an optical pumping with the unprepared low order conversion layer in one pixel by the light which came out of the immediately near pixel which is the phenomenon known as a "cross talk" or a color blot.
The layer of dielectric materials, such as SiOx, SiNx, and polyimide, is put and etched on a substrate 51, the pit formation structure 50 is made from the example shown in drawing 2 B, and it leaves a flat bottom pit among them. The pit formation structure 50 enables formation of the handstand mesa structure of component 24', 27', and 28' by putting the layer which a component contains.
each of the handstand mesa of component 24', 27', and 28' -- the reflexibility metallic contact layer 56, a detached core 53, the blue OLED layer 20, a dielectric layer 55, and a list -- respectively -- handstand mesa component 28' and 27' -- the red or the green fluorescent substances 21 and 22 of ** are included.
Handstand mesa component 28' instead has the i blue OLED layer 20 and the layer of the green fluorescent substance arranged between the red fluorescent substances 21 or on ii red fluorescent substance 21. The metallic contact layer 56 may be made from aluminum, silver, Mg/aluminum, etc. It is desirable to use the metallic contact layer 56 as an interconnect child in addition to serving as a reflector. One clear advantage of using the metallic contact layer 56 as an interconnect child is that it is hidden from component 24' and those who are stationed under 27' and 28', then see. Therefore, as for the made display, anything does not have a dark line between pixels which are often looked at by the conventional display component and which adjoin.

Each handstand mesa includes the transparence surface of action 52 equipped with still thinner (about 50-200A) metal layer 52A of a low work function, and thick (about 500-4000A) ITO coat 52B. Compared with the 1st example, the polarity of cells 30, 31, and 32 is opposite. Consequently, component 24' and the current which flows 27' and 28' are the examples and hard flow of drawing 2 A, when bias is hung on the forward direction, in order to give off light.
High resolution is more possible for the example shown in drawing 2 B than the example generally shown in drawing 2 A. The example which this shows to drawing 2 A is because the distance between a luminescence field and a substrate front face is comparatively large, so a result in which a comparatively large light beam appears from each components 24, 27, and 28 can be brought. If it compares, the light beam which comes out of each of the handstand mesa structure of drawing 2 B will not penetrate a collimator dielectric layer or a substrate ingredient. Compared with the light beam which comes out of each of the mesa component

which shows a result to drawing 2 A, handstand mesa component 24' of drawing 2 B and the light beam which comes out of 27' and 28' will be comparatively narrow.
By etching a dielectric layer and making the pit formation structure 50, in addition to the configuration shown in drawing 2 B which makes a handstand mesa, as shown in drawing 2 C, a handstand mesa can be manufactured component 24' and by making 27' and 28' on the patternized substrate 60. The patternized substrate 60 has a pit and each pit has a substantial flat bottom side and an inclination side attachment wall. Each side attachment wall inclines so that a base and an obtuse angle may be made, and the include angle has about 135 degrees - desirable 145 degrees. It may be comparatively shallow at 1000-3000A order, and the depth of this pit may be large as it is desired. For example, the patternized substrate 60 is made from Si and a pit is made by the standard directivity etching method there. In addition to the pit structure shown in drawing 2 B and drawing 2 C which have a straight line and an inclination side attachment wall, other cross sections are possible. For example, the pit which has a hemicycle or a similar cross section is meant. Moreover, which mesa or handstand mesa of an example of this invention is a top view, and can be arranged on a real target like a square, a triangle, circular, and a hexagon at any forms.
It is desirable that a fluorescent substance absorbs [with which there is no ingredient with a refractive index smaller than the emission layer and fluorescent substance layer of OLED also in which / between them or which / of an example that show drawing 2 A, drawing 2 B, and drawing 2 C, and this OLED layer takes out to them] all photons substantially. This brings a result which increases the red of blue glow, and the transportation efficiency to a green fluorescent substance.
When using it for a multicolor application, each pixel used for the display of this invention gives off red light, green light, and blue glow separately in coincidence. Instead, when using for a monochrome application, each pixel gives off the homogeneous light.
Now, the example of this invention that shows the approach for making multiple color LED on a common substrate to drawing 2 A is explained. Although this approach is roughly shown in drawing 4 A - drawing 4 D, it does not mean drawing them by the scale. : which can use the following process in order to obtain a multicolor organic component array -- the process which puts the 5-10-micrometer transparent dielectric layer 19 on one substrate 37. Dielectric layer 19 Preferably, a refractive index should be equal to a substrate 37, or there should be smaller than it. It is. SiOx or Teflon is sufficient as a layer 19.
2) The process which puts the green fluorescent substance layer 22.
3) The process which puts a thin dirty halt dielectric layer 23 like SiOx.
4) The process which puts the red fluorescent substance layer 21. this component is shown in drawing 4 A after this process It is visible to obtaining.
5) It is reactant ion or wet in order to make the two-dimensional mesa structure as shown in drawing 4 B. Process which carries out photolithography patterning by chemical etching.
6) ** suitable in order to remove the above-mentioned red fluorescent substance 21 from the third of these mesas reactant study ion -- dirty -- therefore -- patterning and etching Process to carry out.
7) in order to remove the above-mentioned green fluorescent substance 22 from the 2nd third of these mesas -- ** this -- chemical or reactant ion -- dirty -- therefore -- patterning and ETSU Process which carries out CHINGU.
8) it is like [in order to make square contact 35 in the upper part of the above-mentioned mesa] ITO -- transparent Process which puts an electrical conducting material.
9) In order to make a stripe contact metal train, put a metal (not shown) on ITO. Process which carries out patterning of stripe contact. Such patterning A shadow mask, lift off, or chlorine reactivity ion of aluminum Therefore, it can be made dirty.
10) The process which puts a separation dielectric 25 like SiNx. This component is this **. It seems to be shown in drawing 4 C after a degree.
11) in order to obtain contact for blue OLED20 -- reactant ion or wet -- dirty -- Process which therefore etches a window into this separation dielectric.
12) The process which puts the blue OLED layer 20 on all things. A layer 20 is . As explained, SH structure or DH structure is sufficient.
13) As shown in drawing 4 D, it is about metallic coating 26M and 261 on all things. It covers and is the metallic reflection of the side face of line metal stripe contact and these mesas. Process which carries out patterning of the vessel 47.
Although it can use in order that the approach enumerated upwards may make the example shown in drawing 2 A, other alternative processes are possible. For example, it is possible to sleep a substrate 37 together directly for the same purpose as this, and to abolish the need for a layer 19 by it instead of putting

and etching a layer 19, in order to make the mesa base to each of components 24, 27, and 28. As another example, a fluorescent substance and an OLED layer can be put with the shadow mask which aligned on the layer 19 which slept together beforehand, or the substrate 37 which slept together beforehand.
Next, the example of this invention that shows the approach for making the handstand multiple color LED on a common substrate 51 to drawing 2 B is explained. It can use in order to make the example shown in drawing 2 C except for using the substrate 60 which patternized the same approach as this instead of the flat substrate 51 equipped with the pit formation substrate 50 upwards. Although this approach is roughly shown in drawing 5 A - drawing 5 E, it does not mean drawing them by the scale. Substrate 51 as which :1 metallic foil which can reach the example shown in drawing 2 B using the following processes, a plastics layer, or other suitable substrate ingredients are sufficient Process which puts the dielectric coat 50 upwards. a layer 50 is obedient to selective etching it should be -- for example, SiOx, SiNx, polyimide, or Teflon ****** .
2) Etch a dielectric coat, leave a field 50 and a flat bottom pit comes out among them. Process it is made to come.
3) Put metallic coating 56 on all things, and they are a mesa reflector and line metal SUTORA. Process which carries out metal patterning in order to make IPU contact.
4) A process like SiO2 which puts a detached core 53. After this process and this component are drawing. It seems to be shown in 5A.
5) The process which opens a window in the above-mentioned separation coat for blue OLED20 contact.
6) The process which puts the blue OLED layer 20 on all things. A layer 20 is drawing previously. As the example shown in 2A was explained, it is also at SH structure or DH structure. It is good.
7) The process which puts transparence ITO contact 52.
8) In order to make train stripe contact, it is patterning about above-mentioned transparence ITO contact 52. Process to carry out.
9) The process which puts a layer 55 of a dielectric material like SiO2. After this process, this base A child seems to be shown in drawing 5 B.
10) The process which becomes a configuration as put the red fluorescent substance layer 21 and shown in drawing 5 C.
11) In order to remove the above-mentioned red fluorescent substance 21 from 2/3 of the beginning of these mesas Patterning and process to etch.
12) The process which becomes a configuration as put the green fluorescent substance layer 22 and shown in drawing 5 D.
13) In order to remove the above-mentioned green fluorescent substance 22 from the 2nd 2/3 of these mesas Process which becomes patterning and a configuration as etched and shown in drawing 5 E.
Although drawing 2 A, drawing 2 B, and drawing 2 C target a multicolor display, they are applicable to a monochrome display including the single mesa or handstand mesa structure where each pixel can take out the mesa and handstand mesa configuration of these drawings only for monochrome.
In the 3rd example of this invention, blue, green, and red OLED are arranged in the laminating configuration 100, as shown in drawing 2 D. Such laminating equipment is indicated by the PCT international public presentation pamphlet WO 96/19792 submitted the United States patent application 08th / No. 354,674, and December 6, 1995 which were submitted on December 13, 1994, and uses those indications here by reference. As argued previously, in order to make guided wave nature into min and to make effectiveness into max, this laminating equipment is used for this invention in relation to mesa structure. In order that the transparence conductive layer 26 may separate each OLED for blue 20, green 110, and red 111OLED from each other in accumulation mutually and each component may give off light through this laminating in the example shown in drawing 2 D, it enables it to receive separate bias potential. As explained previously, SH mold or DH mold is sufficient as each OLED.
As shown in drawing 2 D, the laminating equipment of OLED 20,110 and 111 is arranged on a conductive layer 112, a dielectric layer 19, and the transparence substrate 37.
Each conductive layer 26 contains the conductive layer 261 of the addition suitable for carrying out Mg/Ag, metal layer 26M, for example, Mg, of a low work function (preferably <4eV), Li/aluminum, and electric contact. Of course, all the conductive layers between a substrate 37 and OLED20 must be substantially transparent in a list between OLED(s) 20,110 and 111.
However, since the conductive layer 26 on OLED111 is in the upper limit of this laminating, it does not need to be transparent and it is desirable that it is reflexibility. Terminal 26T are made on the metal layer 26, and it can connect with it electrically and can make from what that is known for In, Pt, Au, Ag and those combination, or this technique, or a suitable ingredient.

The laminating configuration 100 contains optionally the layer 36 of the low loss and the high refractive-index dielectric material like TiO2 between a conductive layer 112 and a dielectric layer 19. A layer 36 is desirable, especially when a conductive layer 112 is made from ITO which is a high loss ingredient so that the guided wave of the light from the OLED layers 20,110 and 111 may be easily carried out to a conductive layer 112 and it may be absorbed.
A layer 36 loses substantially the guided wave nature in ITO, and absorption, and the light which came out of OLED 20,110 and 111 penetrates a layer 36 substantially shortly. Furthermore, since the light by which the guided wave was carried out is reflected in the direction of a substrate 37, a layer 36 can have an inclination side attachment wall.
A shadow mask or dry etching attains manufacture of the laminating OLED pixel 100. For example, the process which puts the 5-10-micrometer dielectric layer 19 transparent on :1 substrate 37 made from the following processes as the laminating OLED pixel 100 is roughly shown in drawing 6 A - drawing 6 D. Dielectric layer 19 A refractive index should be equal to a substrate 37, or there should be smaller than it. Layer 1 SiOx or Teflon is sufficient as 9.
2) The process which puts a layer 112 of a transparence electrical conducting material like ITO. After this process, ** A component seems to be shown in drawing 6 A.
3) The process etched in order to make the mesa structure, as shown in drawing 6 B.
4) The process which puts the blue OLED layer 20. A layer 20 is SH as explained previously. Structure or DH structure is sufficient.
5) The process which puts conductive layers 26M and 261.
6) The process which puts the green OLED layer 110. The layer 110 was explained previously. SH structure or DH structure is sufficient.
7) The process which puts conductive layers 26M and 261.
8) The process which puts the red OLED layer 111. The layer 111 was explained previously. SH structure or DH structure is sufficient.
9) The process which puts conductive layers 26M and 261. After this process and this component are drawing 6 C. It seems to be shown.
10) The process which puts terminal 26T on a reflector 47 and each class 261 on a mesa side attachment wall.
The last component seems to be shown in drawing 6 D.
Although it is shown that a laminating OLED configuration is used for drawing 2 D in relation to the mesa structure, using a laminating OLED configuration in the handstand mesa structure also means this invention. Such the handstand mesa structure is made by covering on the substrate which has the pit which slept together in the substrate which has the dielectric layer which slept together upwards, as the example which shows required OLED and a required conductive layer previously to drawing 2 B and drawing 2 C, respectively, for example was explained. In order to attain a handstand mesa and a laminating OLED component, the stacking order explained above about the example shown in drawing 2 D is reversed.
The further example of this invention was designed so that effectiveness might be made into max and light might be concentrated for a high brightness application. at least one OLED on the light reflex structure to which such an emitter carried out the form of an each transparence substrate, the light reflex layer on this substrate, and the waveguide on this reflecting layer, and this waveguide -- containing -- every -- OLED gives off the light of a predetermined color. A light reflex layer has at least one opening there. In order to reflect in a waveguide side attachment wall and a light reflex layer and to emit the light which came out of OLED from this substrate, it turns to opening of a light reflex layer. Thus, the light which comparatively long OLED generated is concentrated on a comparatively small emission area. Consequently, it becomes high brightness and a high resolution light emitting device.
The 4th example of this invention is shown in drawing 7 A and drawing 7 B which are a side elevation and a top view, respectively. A light emitting device 1000 contains a substrate 1100, the light reflex layer 1110, a waveguide 1120, and the OELD layer 1130. The light reflex layer 1110 has at least one opening 1150, in order to let the light which came out of the OELD layer 1130 pass. In this example, a waveguide 1120 has a top face, an inferior surface of tongue, and at least three side faces.
the side face of a waveguide 1120 -- 2160 accomplishes preferably less than 90 degrees of one include angle of about 45 degrees about a substrate 1100. The remaining side face of a waveguide 1120 is almost perpendicular to a substrate 1100. On a side face 2160, the reflector 1140 is optional and it is desirable that it is in the remaining side face of a waveguide 1120.
In the example shown in drawing 7 A and drawing 7 B, the light which came out of the OLED layer 1130 is

guided in a waveguide 1120, the side face of the light reflex layer 1110 and a waveguide 1120 reflects there, and it turns to opening 1150. Consequently, as shown in drawing 7 A, the concentrated light beam which passes opening 1150 and a substrate 1100 is made.

Although the example shown in drawing 7 A and drawing 7 B is drawn so that light may be turned through a substrate 1100, this invention also includes a "handstand" configuration as shown in drawing 7 C. With such a configuration, a component is arranged to the patternized substrate with a pit so that it may be suitable in the direction in which light separates from a substrate. If the substrate of such a component is not reflexibility, the layer 2170 of a reflexibility ingredient should be included between OLED1130 and a substrate 1100. It may be comparatively shallow at 1000-3000A order, and the depth of the pit of the patternized substrate may be large as it is desired. For example, the patternized substrate 1100 is made from Si and a pit is made by the standard directivity etching method there.

The 5th example of this invention is shown in drawing 8 A and drawing 8 B. A light emitting device 1010 contains a substrate 1100, the light reflex layer 1110, a waveguide 1120, and the OELD layer 1130. At least two [less than 90-degree] of the side faces 2160 of a waveguide 1120 are in the include angle of about 30 degrees preferably about a substrate, and the remainder of a side face is perpendicular to a substrate. The light reflex layer 1110 has opening located under the side face of a waveguide 1120 which is in the include angle of less than 90 degrees about a substrate. As shown in drawing 8 A, the light which came out of the OLED layer 1130 is guided in a waveguide 1120, the side face of the light reflex layer 1110 and a waveguide 1120 reflects there, and it turns to opening 1150. A light emitting device 1010 contains a reflector 1140 optionally, in order to support reflection of the light which came out of the OLED layer 1130. The light which appears from the opening 1150 of a component 1010 is converged on a certain focus 1200. Generally a substrate 1100 is manufactured from glass, a quartz, sapphire, or a transparent material like plastics. A reflector 1140 is a speculum or a multiplex dielectric laminating, and its latter is [among these] desirable. supposing it uses a speculum -- a reflector 1140 -- some -- a suitable metal or a suitable alloy -- it makes from aluminum, silver, magnesium aluminium alloys, and those combination preferably. If it is a multiplex dielectric laminating, it makes from which pair of a dielectric material like TiO_2 and SiO_2 which has a different refractive index so that a reflector 1140 may be known with this technique. As for the light reflex layer 1110, it is desirable to make in a high reflexibility multiplex dielectric laminating.

The need for the optional reflector 1140 depends on the ingredient used for a waveguide 1120, and it is what or the suitable transparence dielectric material like SiO_2, polyimide, or Teflon. The light which shines upon the inclination wall of a waveguide 1120 is reflected completely the optimal, and all internal reflection is produced by it. However, a reflector 1140 is needed if this cannot attain because of the ingredient used for a waveguide 1120. For example, the ingredient (or environment) surrounding the ingredient and waveguide which are used for a waveguide has the property refractive indexes n2 and n1, respectively. Critical angle thetac** defined as the minimum angle from which it is shown in drawing 9 , and total internal reflection happens is related to n2 and n1 according to formula sin(thetac) = (n1/n2), however n1<n2. Therefore, when the refractive index n2 of a waveguide 1120 increases, it turns out that thetac decreases to n1 [smaller than n2] fixed. Therefore, when the refractive index of a waveguide 1120 is far larger than that of a perimeter ingredient (or environment), thetac becomes min and internal reflection becomes happening more. In this case, a reflector 1140 may be unnecessary. On the contrary, when n2 is the same as that of n1, thetac may become max, and it may be lost that internal reflection is likely to happen more, therefore a reflector 1140 may be needed.

Although it is flat on a drawing and a reflector 1140 is shown in it as a linear member, a different configuration is sufficient as them. For example, the configuration of a reflector 1140 can have the focusing effectiveness in an incident light beam by a curve or parabolic.

In order to make an internal loss into min, a thing with the refractive index of a waveguide 1120 higher than a conductive layer 1500 is desirable. Moreover, there should be a refractive index of a waveguide 1120 more highly than that of a substrate, in order to avoid that light leaks from a waveguide 1120 to a substrate 1100 through the light reflex layer 1110. Furthermore, the light emitting device of this invention can contain optionally the layer 1170 of the low loss and the high refractive-index dielectric material like TiO_2 under a conductive layer 1500. A layer 1170 is desirable, especially when it makes from ITO which is a high loss ingredient so that the light to which it came out of the conductive layer 1500 from the OLED layer 1130 can be absorbed. The refractive index to TiO_2 and TIO is about 2.6 and 2, respectively.

It is 2. Therefore, a layer 1170 loses substantially the guided wave nature in ITO, and absorption. Although there should be a refractive index of a layer 1170 more greatly than that of a layer 1500, there should be it smaller than the refractive index of a waveguide 1120 so that the light which came out can move from a

layer 1170 to a layer 1120 easily. In the further efforts on it for for reducing an internal loss, in order to profit by making easy transfer of the light from a waveguide 1120 to the inside of a substrate 1100 for the layer 1190 of low loss and a high refractive-index dielectric material as low reflectance coating for helping, it arranges optionally to opening 1150. A layer 1190 can be arranged also under a substrate 1100, as shown in drawing 7 A and drawing 8 A. A layer 1190 is Teflon.

In every example of this invention, OLED or the thing of duplex hetero structure of single hetero structure is sufficient as the OLED layer 113 so that it may be known for this technique. Since it is easy, OLED used for this invention is shown in a drawing as a monolayer, although each OLED contains many sub layers in fact if that OLED is not a monolayer polymer so that it may be known for this technique. There is an electrode layer of a large number required as moreover shown in drawing 10 A - drawing 10 C, in order that the OLED layer 113 may operate.

As shown in drawing 10 A, the metal layer 1510 of a low work function (preferably <4eV) is made on the top face of the OLED layer 1130. The suitable candidate for the metal layer 1510 has Mg, Mg/Ag, and Li/aluminum. The metal layer 1510 serves as a charge of a reflector for reflecting the light beam which carries out incidence as a contact ingredient for the OLED layer 1130. It is another conductive layer 1520 suitable for carrying out electric contact which was put on the upper part of the metal layer 1510. A conductive layer 1520 is made from ITO, aluminum, Ag, or Au. The light emission from OLED1130 applies an electrical potential difference between a conductive layer 150 and a conductive layer 1520, and when producing emission from EL of the OLED layer 1130 by it, it happens. In order to carry out light energy low order conversion, the layer 1160 of a fluorescent substance may be optionally included in the color of a request of the light which came out of the OLED emission layer. The example shown in drawing 10 A produces homogeneous-light emission.

Instead, in order to make multicolor application easy, the OLED layer 1130 contains blue OLED1600, green OLED1610, and red OLED1620, as shown in drawing 10 B. Each of blue, green, and red OLED can respond separately so that ********, blue, green, and red light may be given off independently.

Instead, blue, green, and red OLED are arranged in the configuration repeated as shown in drawing 10 C. Such laminating equipment is indicated by the PCT international public presentation pamphlet WO 96/19792 submitted the United States patent application 08th / No. 354,674, and December 6, 1995 which were submitted on December 13, 1994, and uses those indications here by reference. In order that layers 1510 and 1520 may separate each OLED for blue 1600, green 1610, and red 162OLED from each other in accumulation mutually and each component may give off light through this laminating in the example shown in drawing 10 C, it enables it to receive separate bias potential. Since the metal layer 1520 arranged in this example between OLED ingredients (for example, between layers 1600 and 1610 and between layers 1610 and 1620) is transparent, it is thin enough, and its metal layer 1520 of the upper part of red OLED1620 which is the best conductive layer of this component is thick enough for reflecting the light beam which carries out incidence. As explained previously, SH mold or DH mold is sufficient as each OLED 1600, 1610, and 1620. As shown in drawing 10 C, the laminating equipment of OLED 1600, 1610, and 1620 is arranged on a conductive layer 1500.

The covering technique over which of the approach and ingredient which were enumerated upwards is also well known for this technical field. For example, the suitable approach that the suitable approach that the suitable approach that the suitable approach that the suitable approach which puts an OLED layer puts; metal layer by heat vacuum evaporationo or spin coating puts;ITO by heat, electron beam evaporation, or sputtering puts; fluorescent substance layer by electron beam evaporation or sputtering puts; and a dielectric by heat vacuum evaporationo or sputtering is plasma acceleration study vacuum evaporationo or electron-beam-evaporation ****.

The important advantage of the example of this invention using the light reflex layer 1110 is concentrating the light which comparatively long OLED's generated on a comparatively small emission area. Consequently, it becomes high brightness and a high resolution light emitting device. If increasing until the effectiveness of this component reaches a certain optimal die length (LOPT) if die-length L of each component of this invention increases is expected and it is exceeded, the loss in a component will become large, therefore effectiveness will fall. A graph shows this phenomenon to drawing 11 . then, the twice of the example which generally shows the example which has two openings 1150 in the light reflex layer 1110, and converges a light beam on a focus 1200, and which is shown in drawing 8 to drawing 7 -- being bright . Then, although die length is made in half [of the example shown in drawing 7] by the example shown in drawing 8 , it still has the same synthetic light reinforcement.

As for high brightness luminescence using the light reflex layer 1110 produced from the example of this

invention, high brightness, monochrome, or multicolor luminescence makes such a component useful for such an application besides [required] something at a xerography, a copy, printing and a display application, and a list. Therefore, the example illustrated and explained can be used for an application as two or more independent or pixels. For example, when using in order to make the flat panel Rhine scan display unit which contains two or more pixels for this invention, each light emitting device which was explained here can express each pixel or its part.

The formula of the metal bidentate coordinated complex which can be used for the blue luminescence OLED of which example of this invention is MDL42, however M is chosen from the 3-13th groups of the periodic table, and the trivalent metal of a lanthanide. Suitable metal ions are aluminum+3, Ga+3, In-3, and Sc+3. D is bidentate ligand like 2-picolyl ketone, 2-chinae-cortex RUJIRU ketone, and 2-(o-phenoxy) pyridine ketone. Choosing acetylacetonate, the compound of formula OR3R, however R3 as the suitable radical to L4 from Si and C, R is selection and ****** to hydrogen, a permutation and non-permuted alkyl, and an allyl compound list from heterocycle radical;3, 5-JI (t-butyl) phenol;2, 6-JI (t-butyl) phenol;2, and 6-JI (t-butyl) cresol; and H2B pz2. As an example, the wavelength obtained from the photo-luminescence measurement by the solid state of an aluminum (PIKORI methyl ketone) screw [2 and 6-JI (t-butyl) phenoxide] is 420nm. The cresol derivative of this compound was also measured and it was 420nm. The aluminum (PIKORI methyl ketone) screw (OsiPh3) and the scandium (4-methoxy-PIKORI methyl ketone) screw (acetylacetonate) were 433nm respectively, and, on the other hand, the aluminum [2-(O-phenoxy) pyridine] screw [2 and 6-JI (t-butyl) phenoxide] was 450nm.

It has a tin (iv) metal complex, for example, the formula of SnL 12L22, for the example of a green OLED emission ingredient, and there are some which were chosen from the salicylaldehyde, the salicylic acid, or the kino rate (for example, 8-hydroxyquinoline) in it. A heterocycle radical is sufficient as L2 at a permutation and non-permuted alkyl, and an allyl compound list. L1 is a kino rate, and the emission wavelength of a tin (iv) metal complex will be set to 504nm when L2 is phenyl.

There is a divalent metal MAREO nitril dithio rate ("mnt") complex, for example, the thing which the outside of C.E. Johnson has indicated to the "luminescent (iridium I) (rhodium I) platinum (II) dithio rate complex" and the 105 journal OBU American chemical society 1795 (1983), in the example of a red OLED emission ingredient.

For example, this mnt [Pt (Pph3)2] performs 652nm natural wavelength emission.

The additional OLED ingredient is known for this technique (for example, U.S. Pat. No. 5,294,870 of the name "the organic electroluminescence image display device" besides tongue; 67 the outside of HOSOKAWA, "the efficient blue electroluminescence color from the JISUCHIRIRU arylene emission layer by the new dopant", applied physics letter 3853-55 (December, 1995)).

; 56 The outside of ADACHI, "blue luminescence organic electroluminescence devices", the applied physics letter 799-801 (February, 1990); refer to "color adjustment possible organic light emitting device" 69 applied physics letter 2959-61 (November, 1996) Burroughs outside. All indications of such bibliographies are used here by reference. A JISUCHIRIRU arylene derivative which the outside of HOSOKAWA has described is the compound of a suitable class.

The red and the green luminescence fluorescence medium which are used for this invention are well known for this technique. U.S. Pat. No. 4,769,292 and No. 5,294,870 are examples, and uses those indications here by reference. These fluorochromes could be dissolved in a matrix polymer like polymethyl methacrylate, and many of suitable coloring matter was developed for plastics laser from the first. The examples of a red fluorochrome are a 4-dicyanomethylene-4H-pyran and 4-dicyanomethylene-4H-thiopyran. There is [poly methine coloring matter, for example, cyanine, and a merocyanine list] SUTOREPUTO cyanine in the example of a green fluorochrome at a tree, a tetrapod, polykaryotic cyanine and merocyanine, oxo-Norian, hemi oxo-Norian, styryl, and a MEROSUCHIRIRU list.

The component of this invention brings about the low cost, the high resolution, the high brightness, the monochrome or multiple color of the magnitude of arbitration, and a flat-panel display. This is extended so that smallness may include the range of this invention and size may include the display to the magnitude of a building from several mm. Therefore, the image made on this display is good for the magnitude of each LED with the full color text or full color illustration of resolution of arbitration. Therefore, the component of this invention is suitable for the very various applications which contain the display unit for using for a notice plate and a signboard, a computer screen, telecommunication equipment like a telephone, television, a large area wall surface screen, a theater screen, and a stadium screen in an electronic display, laser, a lighting system, and a list. Since the example of this invention which turns the light which came out in the direction which separates from a substrate enables contiguity arrangement to a print form, without using a

lens, it is useful for especially a xerography application.
This contractor may think of various modification in the example of this invention explained and illustrated here. The pneuma and the range of a claim of attached plan to include such modification.

[Translation done.]

DRAWINGS

[Drawing 1]

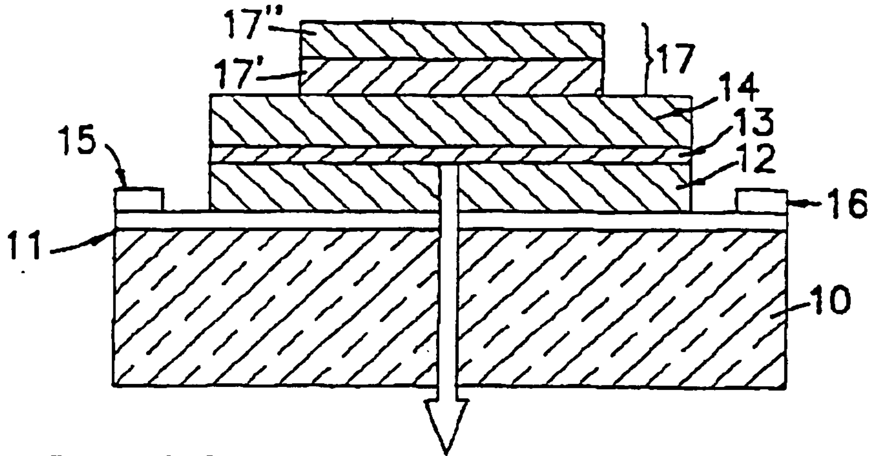

FIG. 1A
先行技術

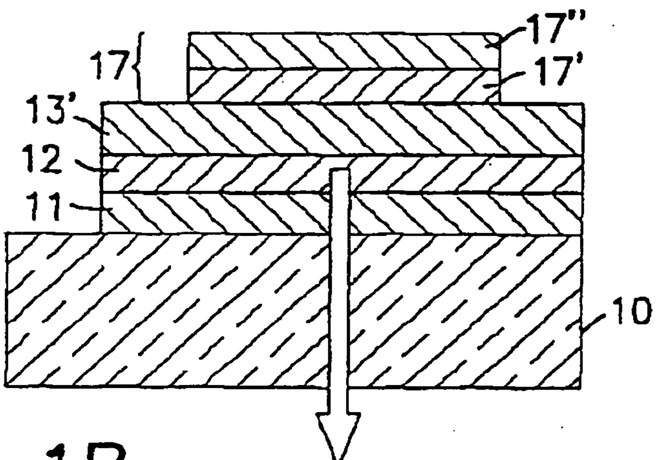

FIG. 1B
先行技術

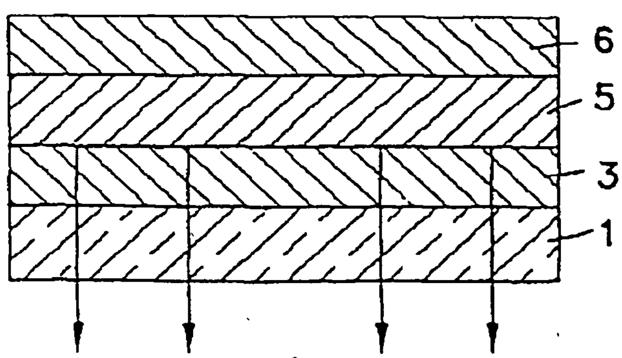

FIG. 1C
先行技術

[Drawing 1]

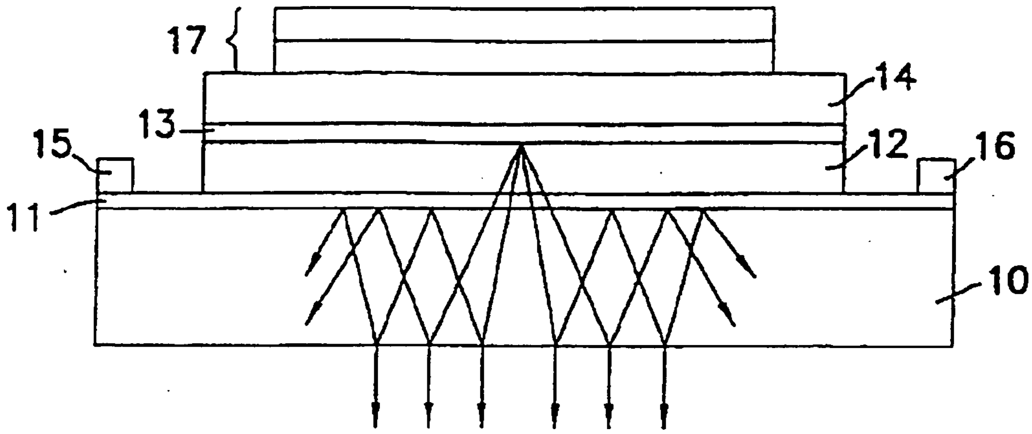

FIG. 1D

先行技術

[Drawing 2]

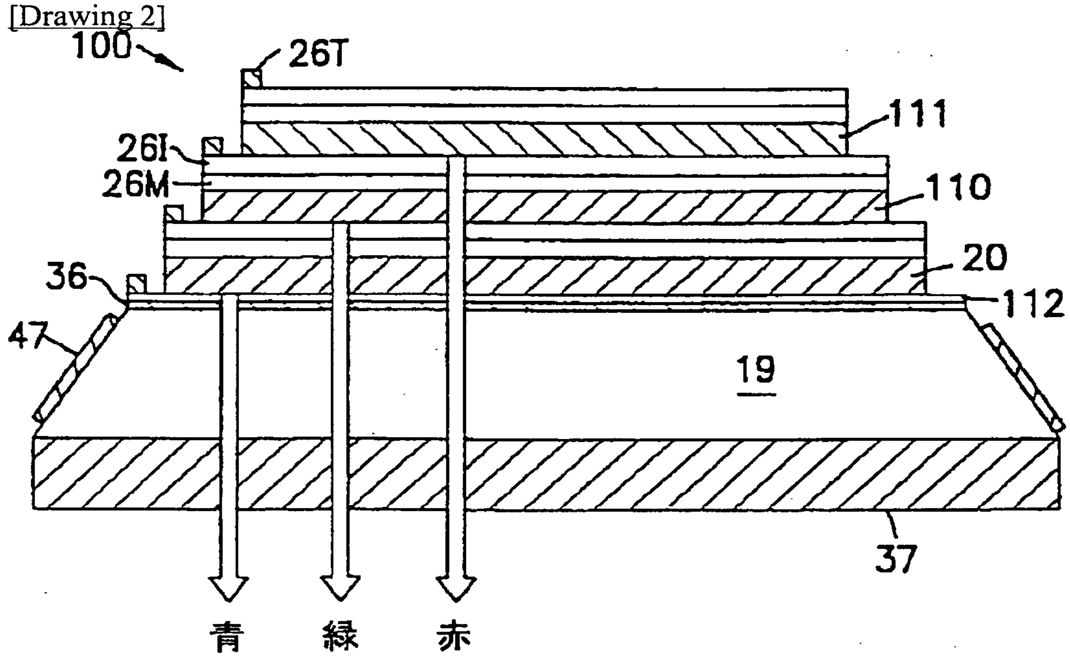

FIG. 2D

[Drawing 2]

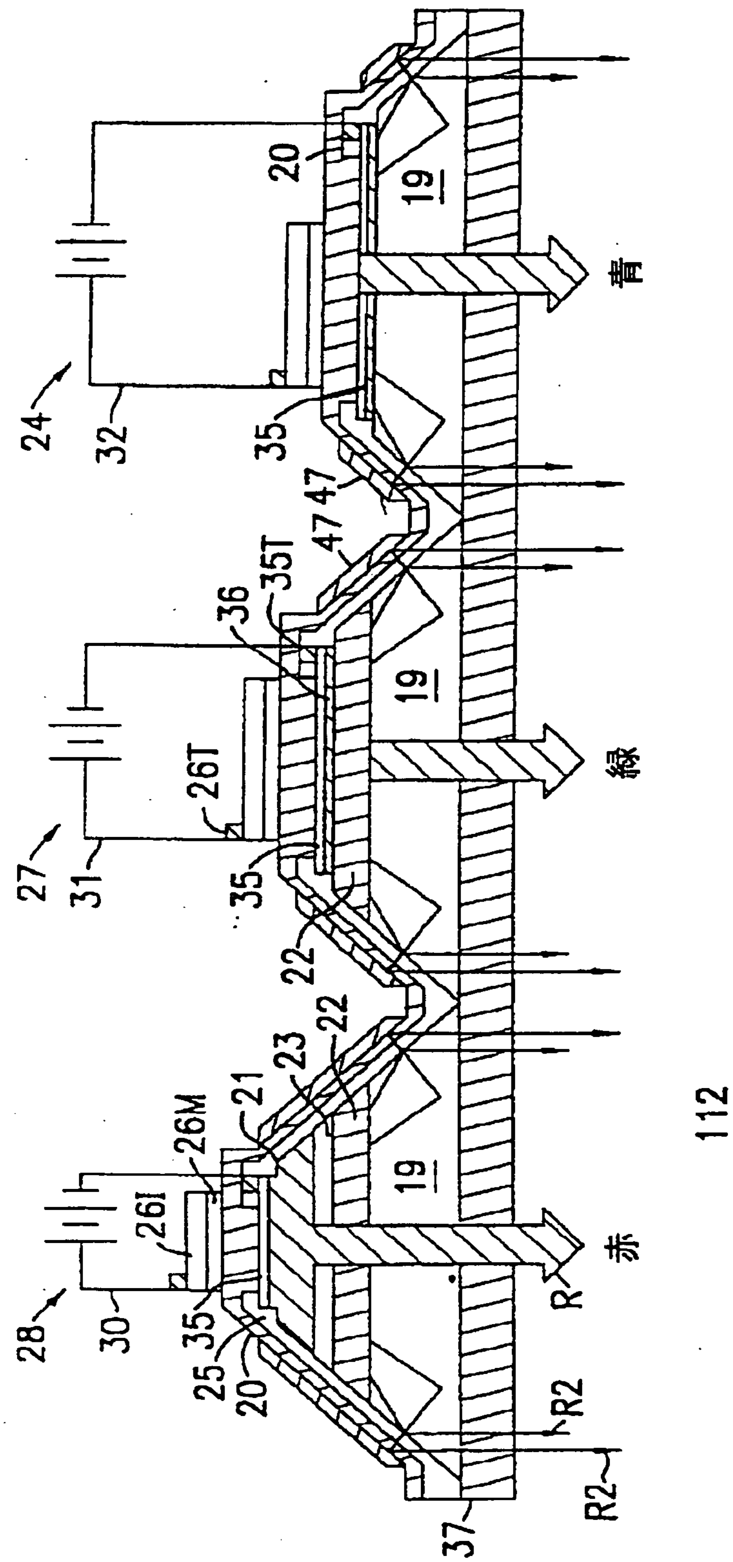

FIG. 2A

[Drawing 2]

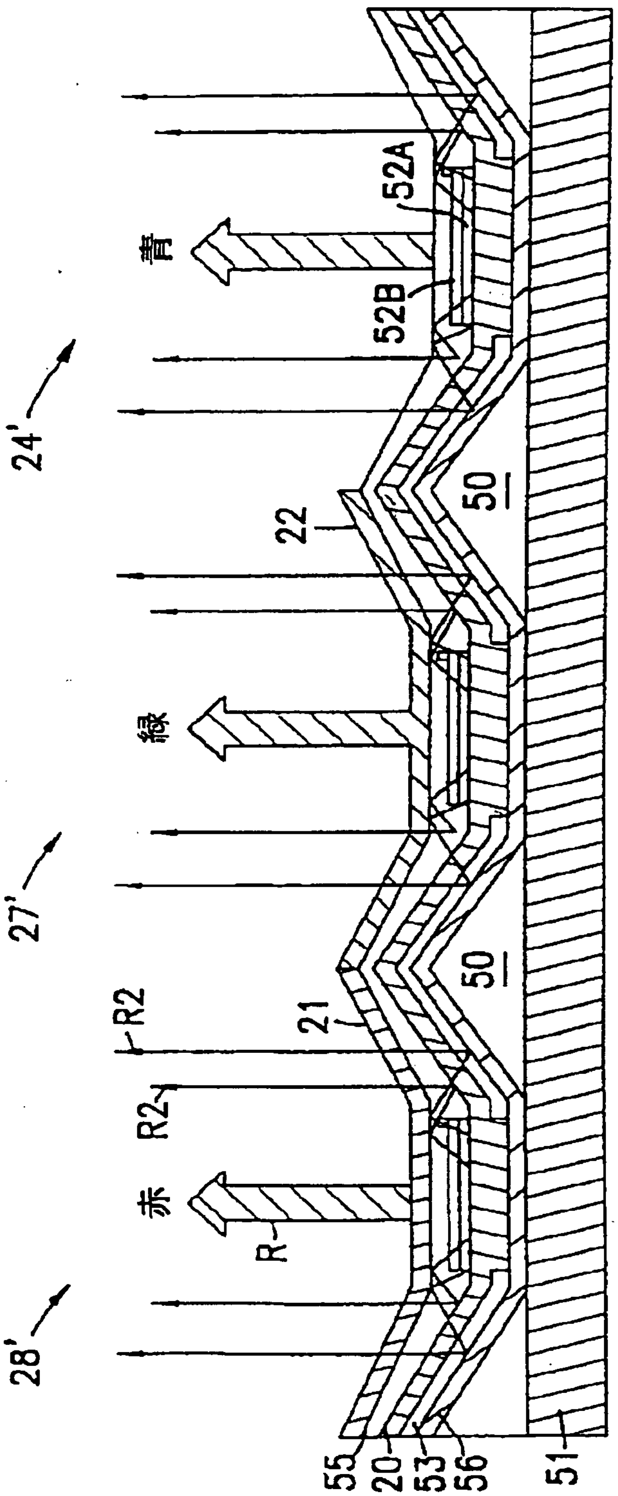

FIG. 2B

[Drawing 2]

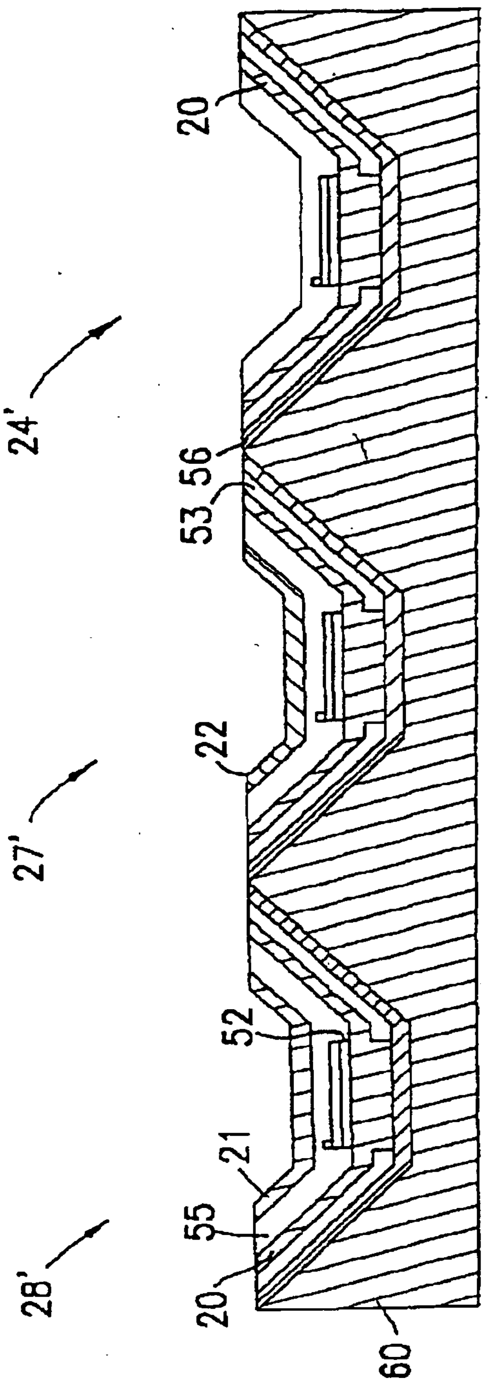

FIG. 2C

[Drawing 3]

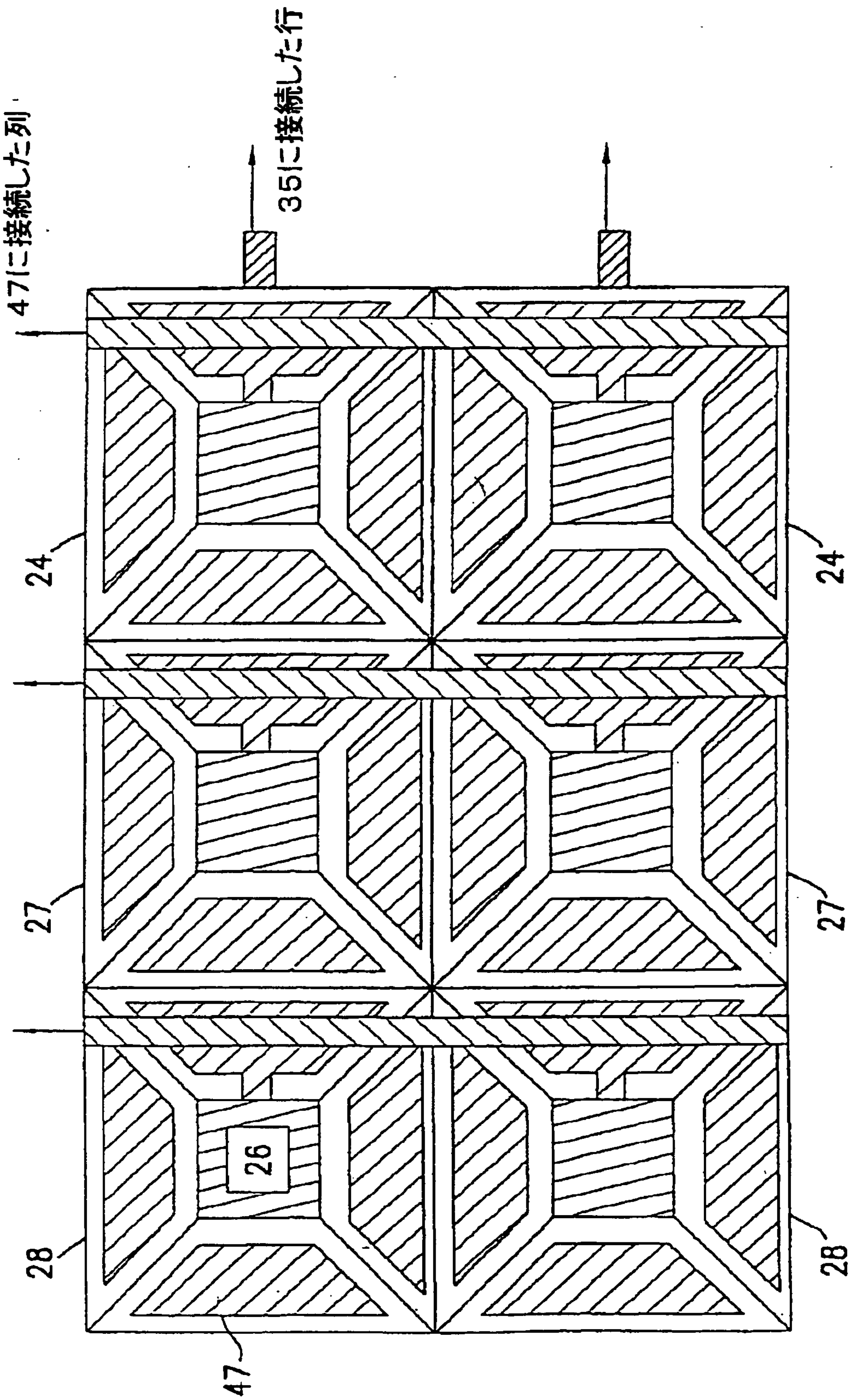

FIG. 3

[Drawing 4]

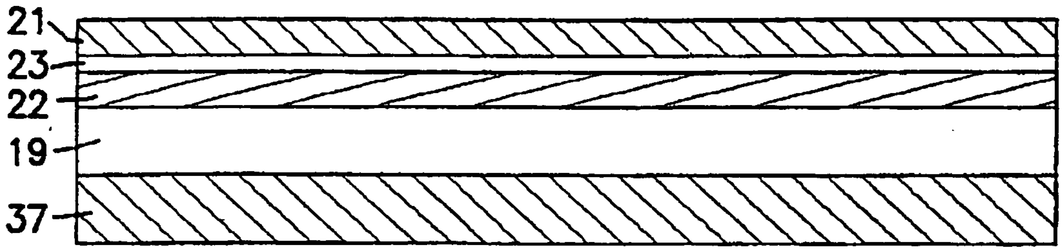

FIG. 4A

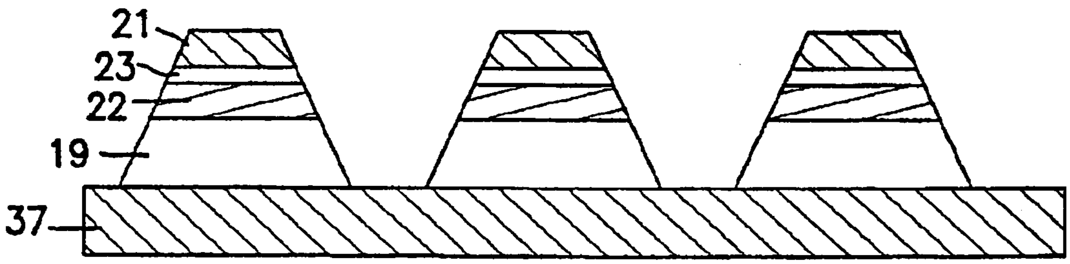

FIG. 4B

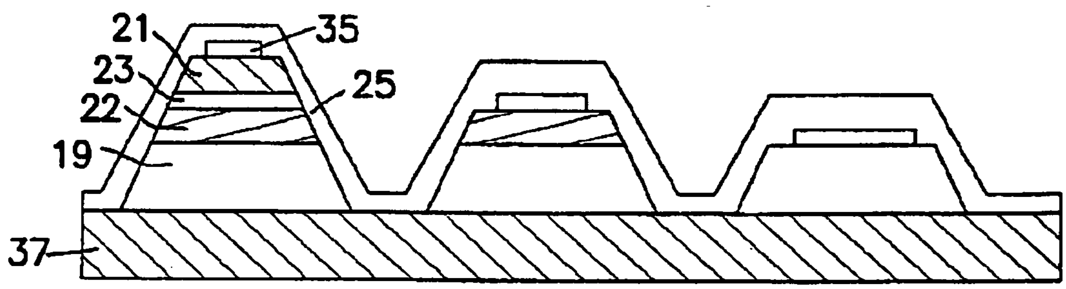

FIG. 4C

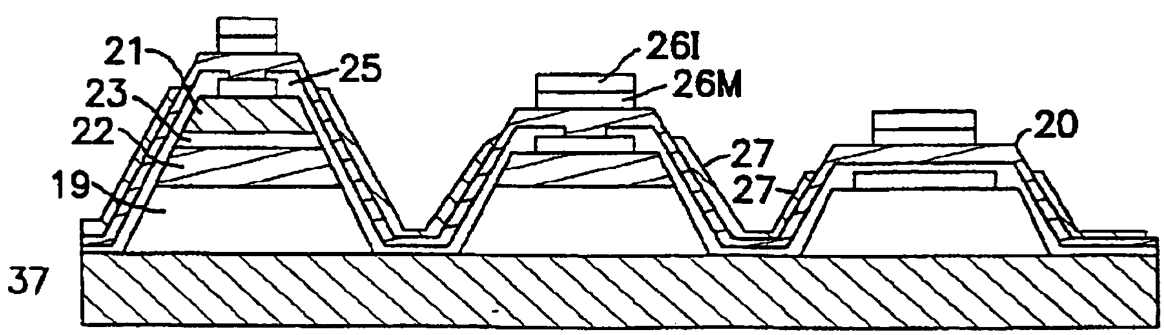

FIG. 4D

[Drawing 5]

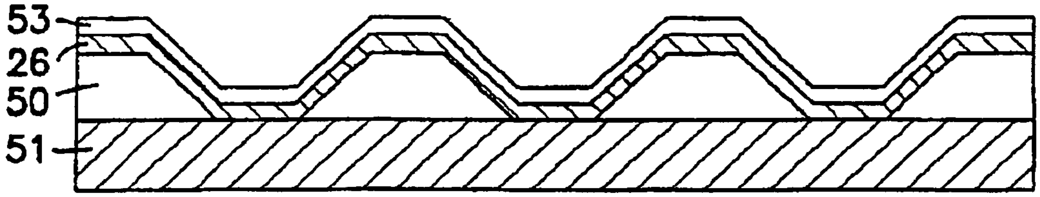

FIG. 5A

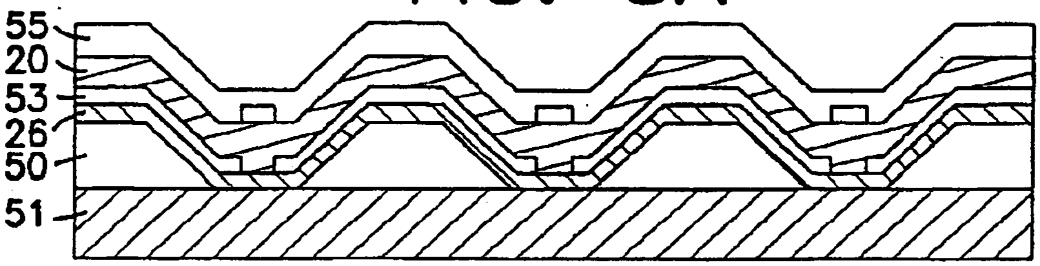

FIG. 5B

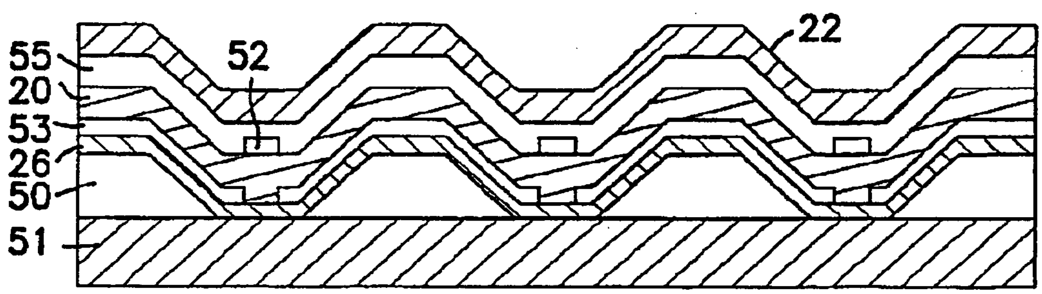

FIG. 5C

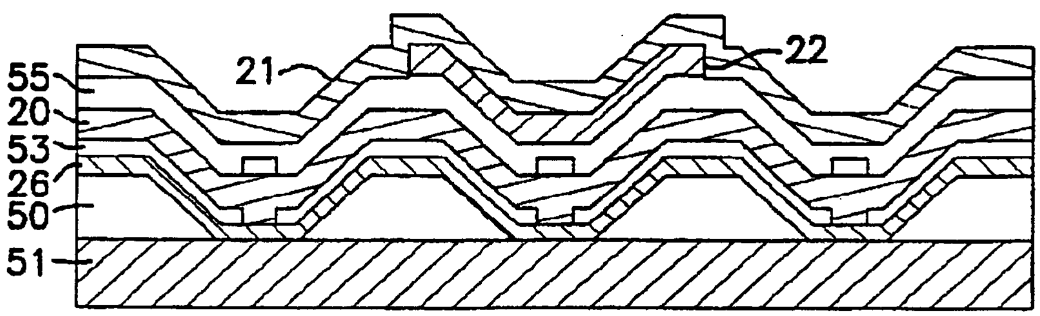

FIG. 5D

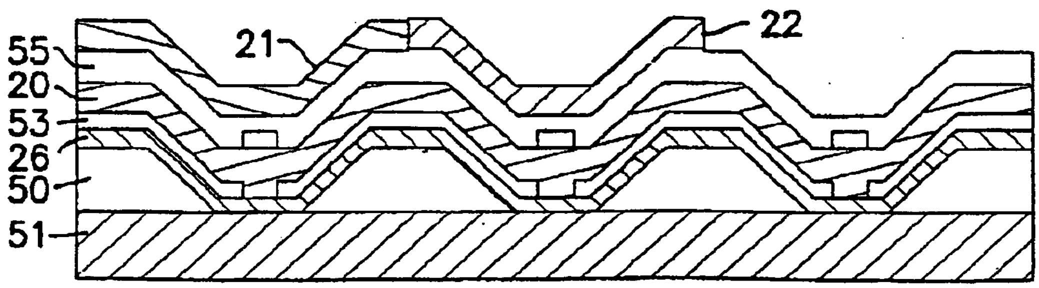

FIG. 5E

[Drawing 6]

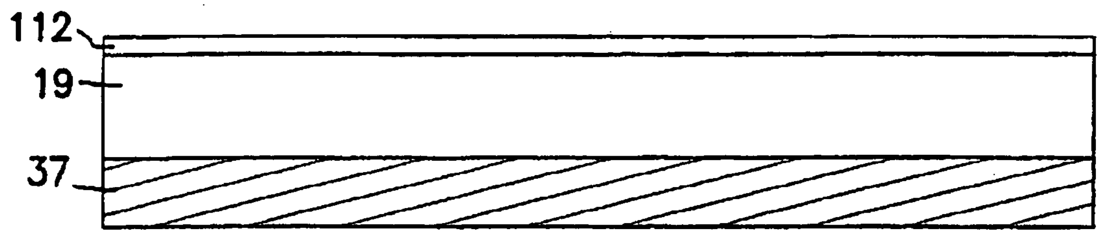

FIG. 6A

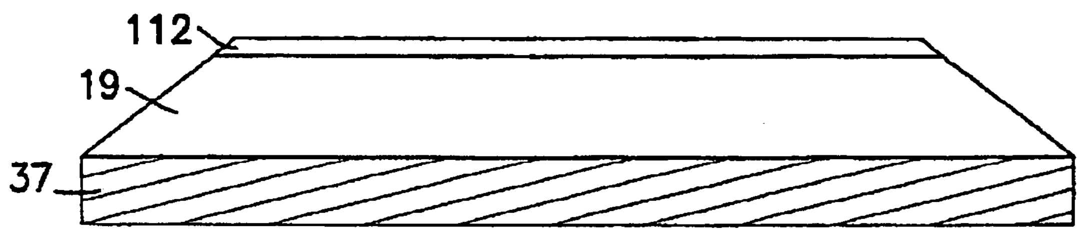

FIG. 6B

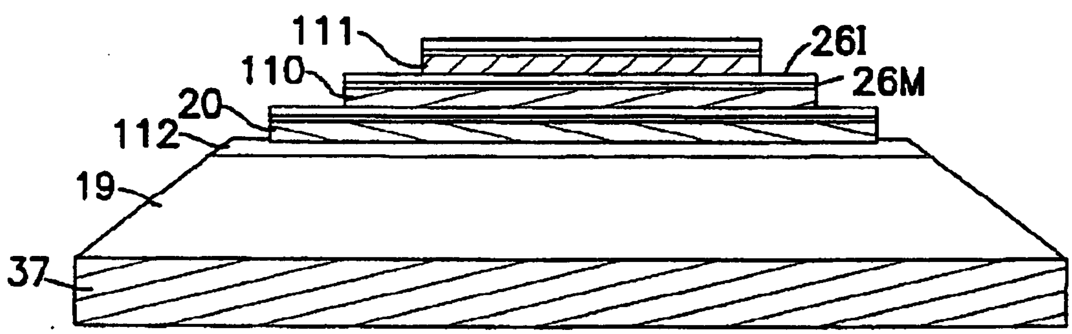

FIG. 6C

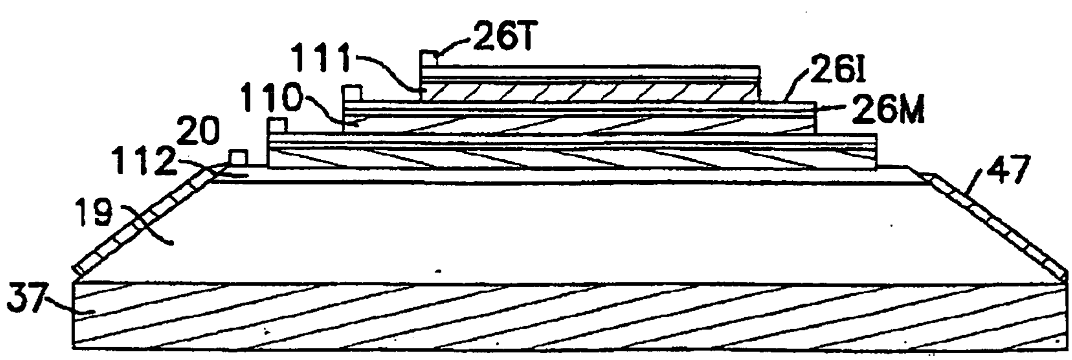

FIG. 6D

[Drawing 7 A]

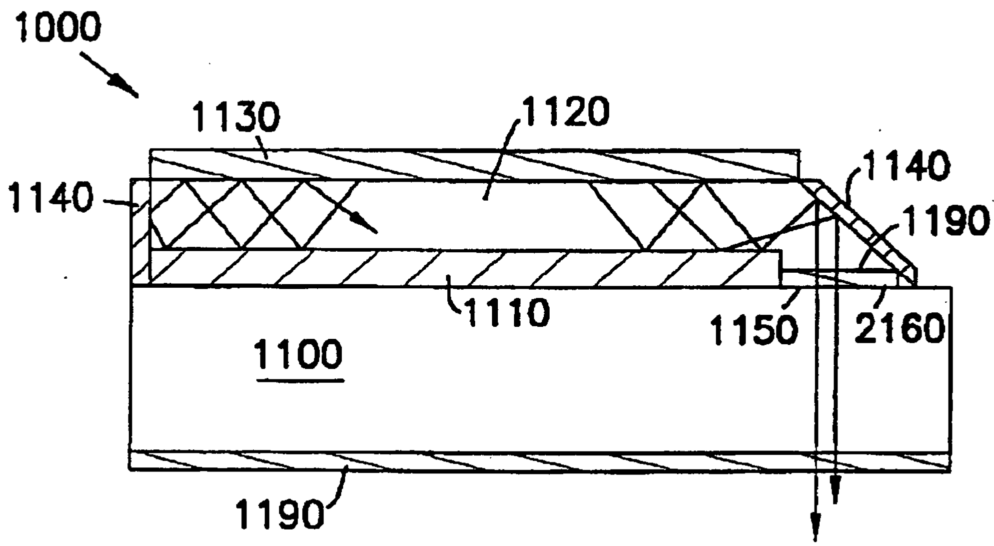

FIG. 7A

[Drawing 7]

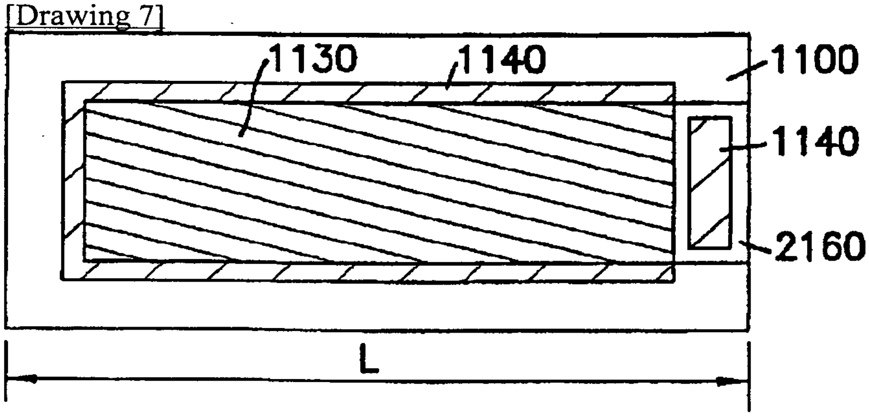

FIG. 7B

[Drawing 7]

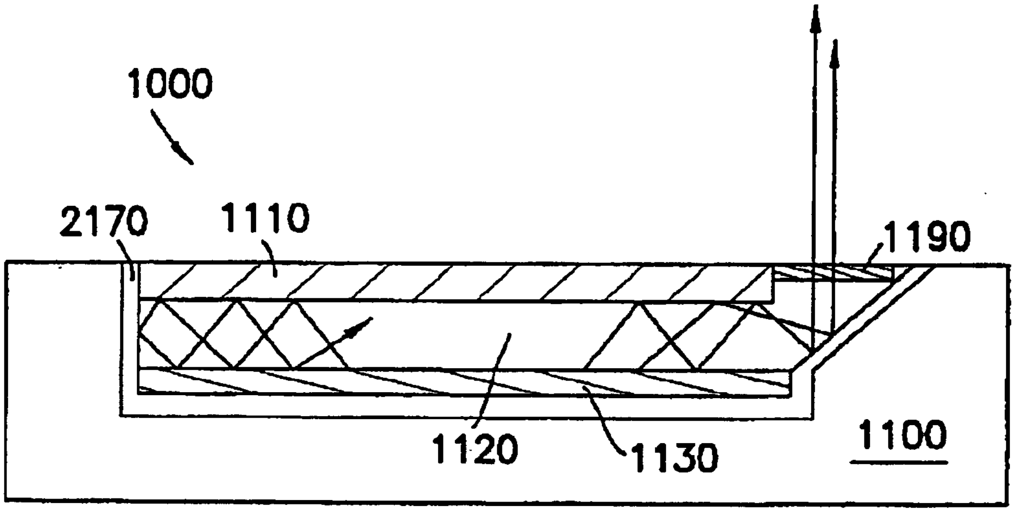

FIG. 7C

[Drawing 8]

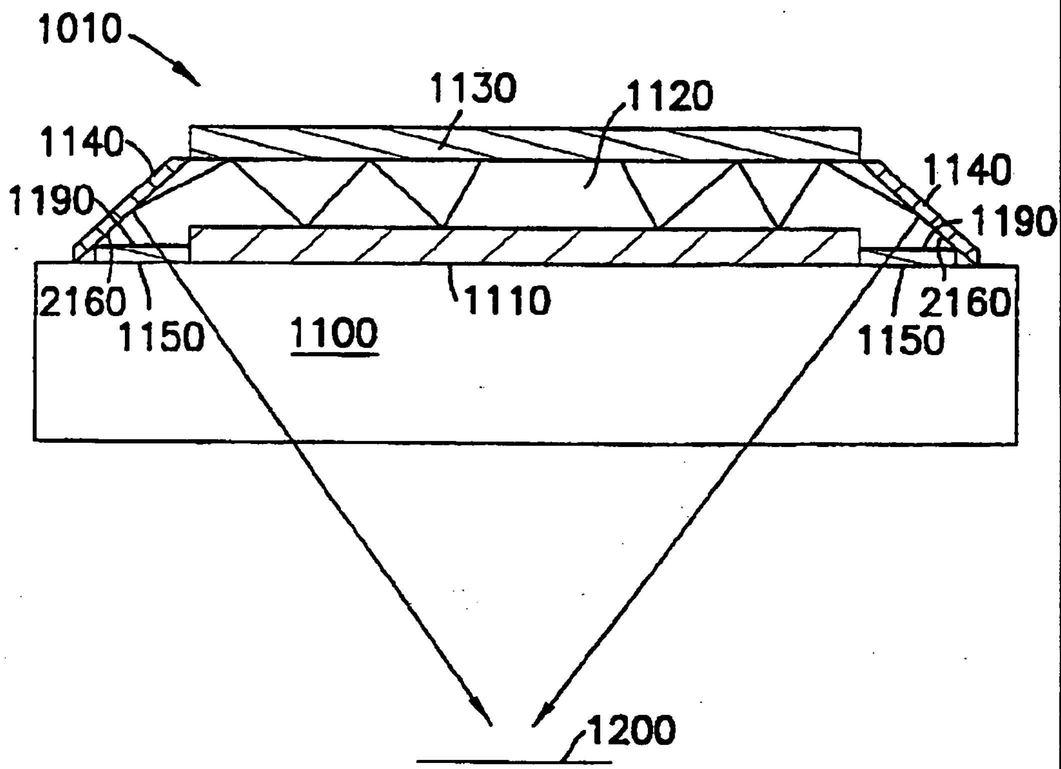

FIG. 8A

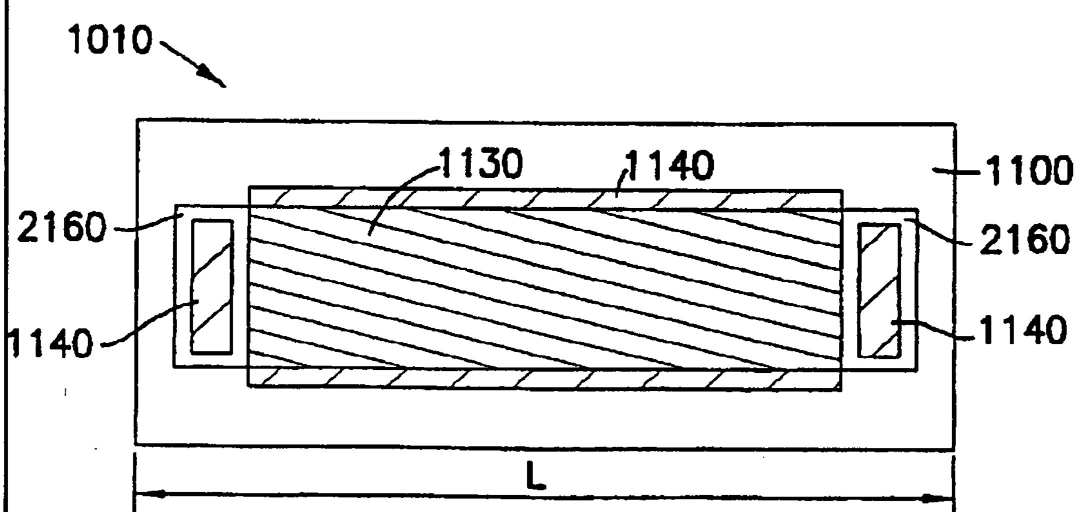

FIG. 8B

[Drawing 9]

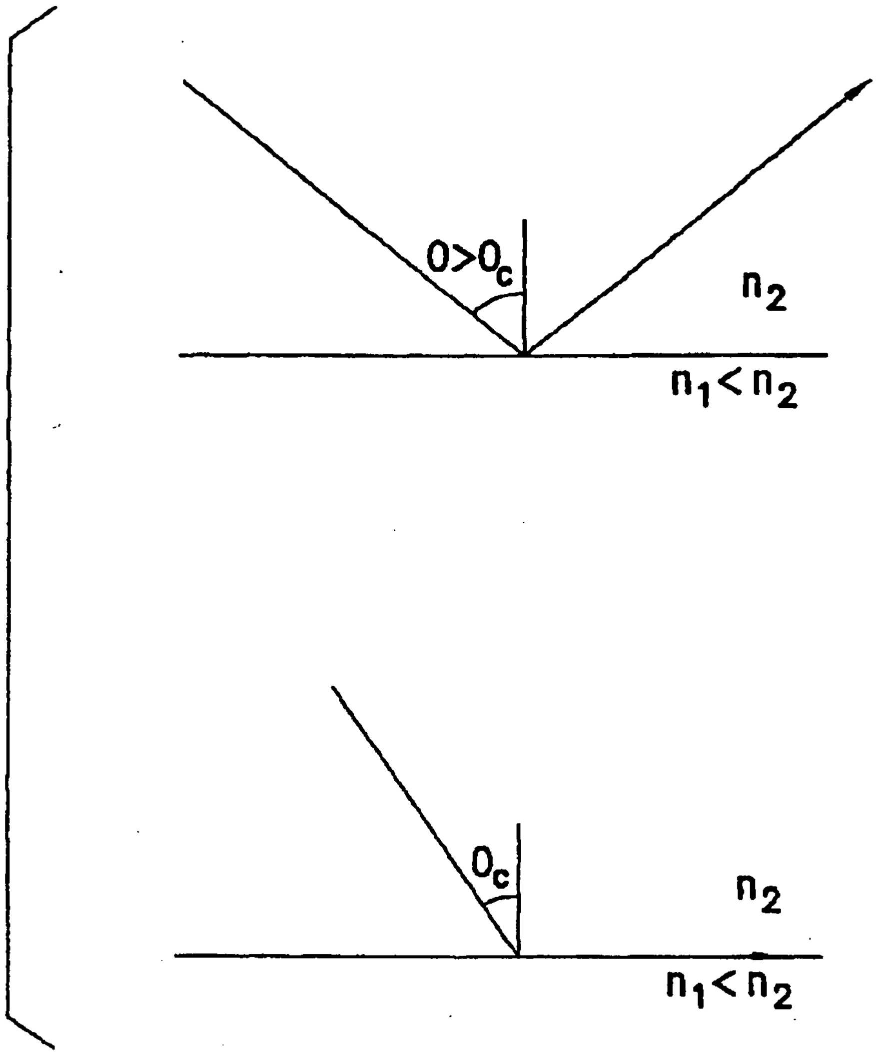

FIG. 9

[Drawing 10]

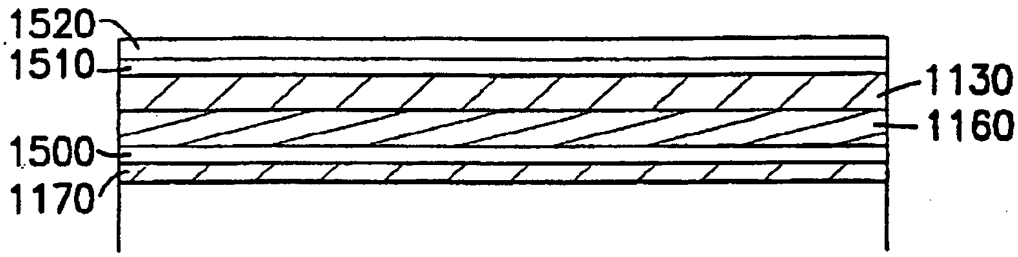

FIG. 10A

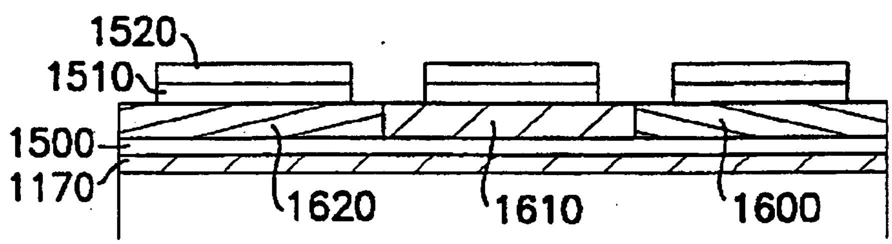

FIG. 10B

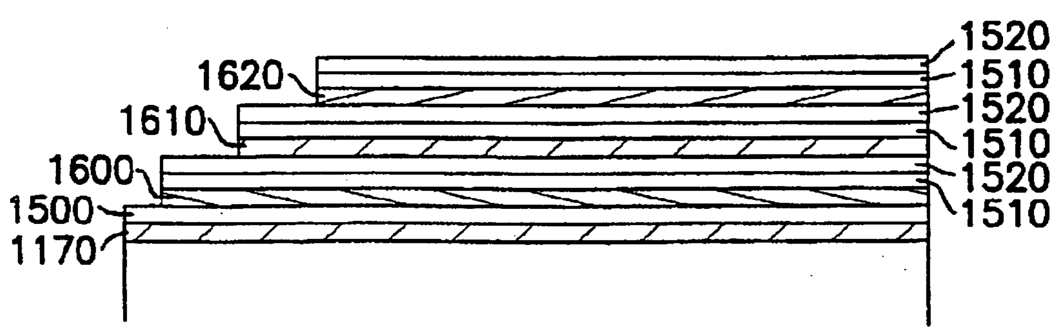

FIG. 10C

[Drawing 11]

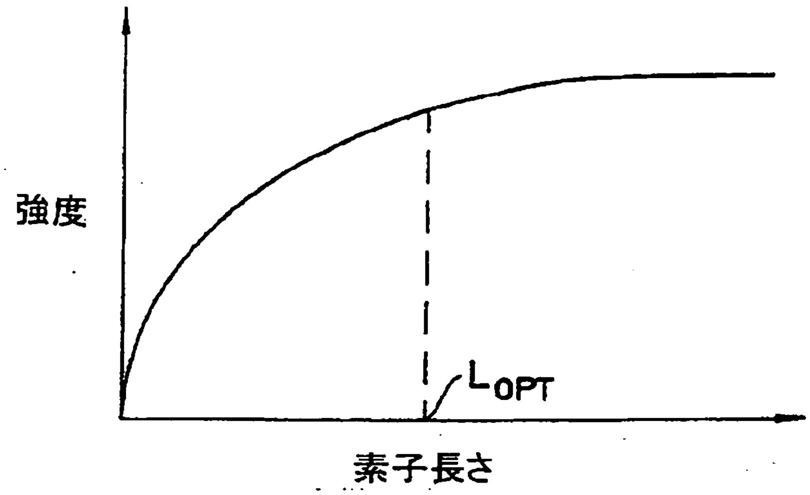

FIG. 11A

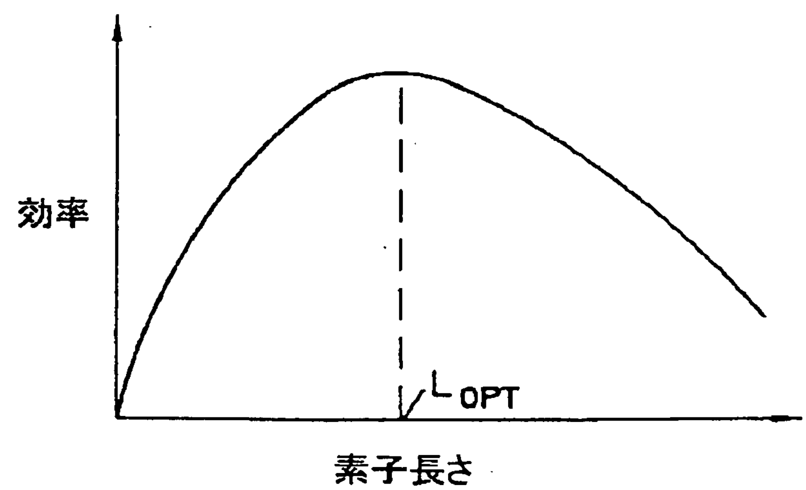

FIG. 11B

[Translation done.]